Chapter 7
The Recommended Sanitary Wastewater Master Plan

The recommended plan to improve wastewater management practices throughout the Keys is illustrated in Exhibit 7-1, and includes four principal components:

1. Upgrade or replace existing onsite systems with onsite wastewater nutrient reduction systems (OWNRS) in "Cold Spot" Areas, which are located in lower density areas of the Keys. ("Hot Spot" areas are defined in Chapter 6 and are depicted in Exhibit F-1 in Appendix F. Areas not designated as "Hot Spots" are "Cold Spot" areas.)
2. Implement central community wastewater collection and treatment system service areas in the more densely developed and highest ranked "Hot Spot" areas where service area analyses indicate central sewer systems are more cost effective and environmentally sound (see discussions in Chapter 5 of this Master Plan and Technical Memorandum No. 12 in Volume 5, *Supporting Documents*).
3. When the number of community treatment systems and the number of customers in selected areas of the Upper and Middle Keys (i.e., Marathon, Islamorada, Tavernier, and Key Largo) increase to the point where it is no longer economical to operate community treatment systems, consolidate them into larger regional treatment systems.
4. Phase implementation of smaller regional systems in the Lower Keys and construct the treatment plants at the proposed regional sites, so that interim community treatment systems are not necessary.

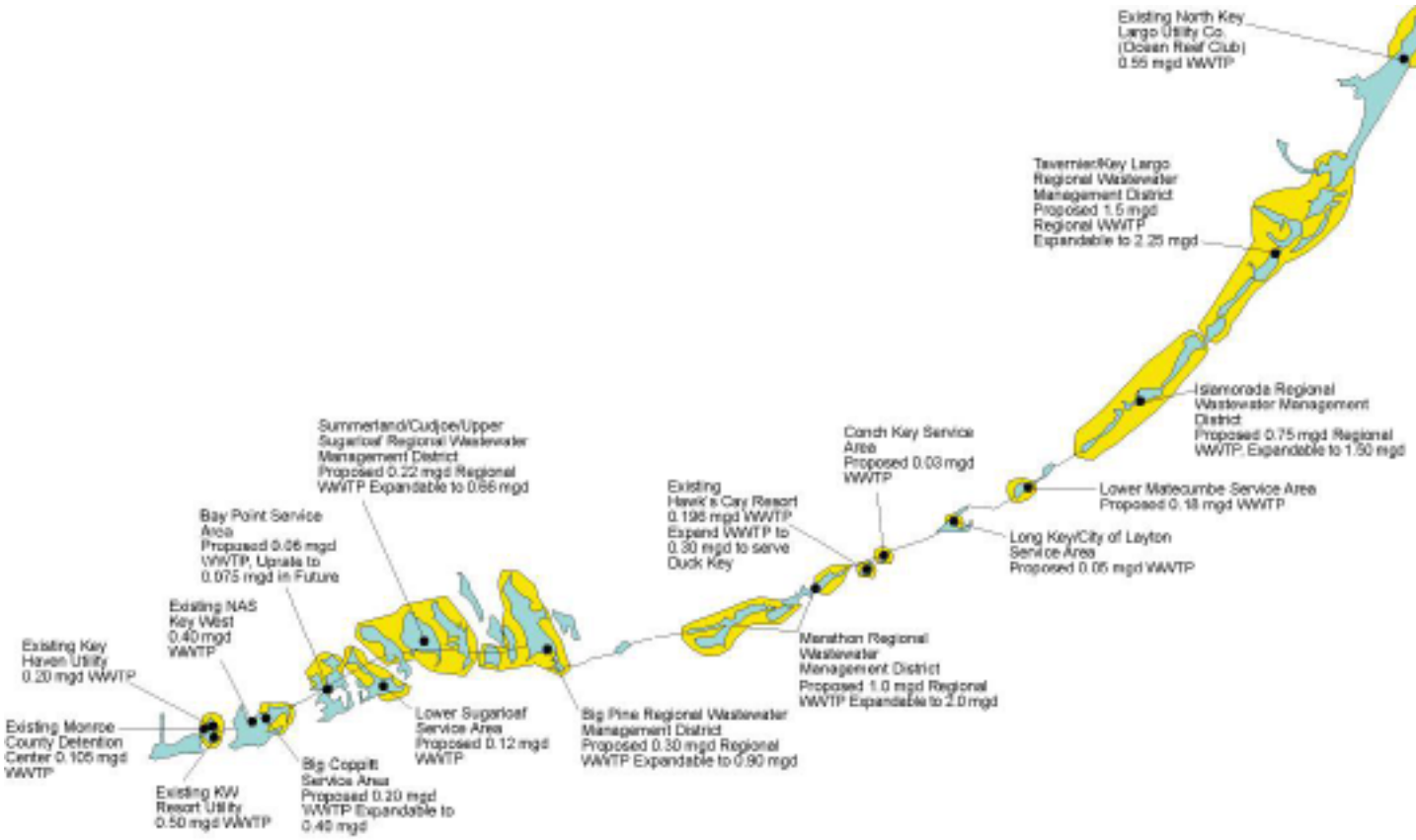


EXHIBIT 7-1
Recommended Wastewater Master Plan Service Areas and Wastewater Treatment Plants

Not all areas are conducive to being consolidated into a regional system because of the distance that would be required between study areas, and consequently, the higher costs associated with implementation of this option. This is particularly true in the Lower Keys.

Therefore, many areas will remain central community wastewater collection and treatment system service areas, and will continue serving one or several "Hot Spot" areas because it is not cost effective to do otherwise. Details of this plan are illustrated in Exhibit F-1 in Appendix F.

7.1 Onsite Systems for "Cold Spots"

Properties within "Cold Spot" areas where onsite systems will continue to operate fall into two categories:

- Those properties with unknown systems that must replace or upgrade their system immediately with a nutrient reduction OWNRS. All these systems must be replaced or upgraded by July 12, 2003.
- Those properties that currently have permits for their onsite systems and will not be required to upgrade or replace them until 2010, when all onsite systems must be upgraded or replaced with nutrient reduction OWNRS to meet the statutory effluent limits of 10/10/10/1.

Capital costs required to implement the onsite systems improvements in "Cold Spots" are summarized in Exhibit 7-2.

EXHIBIT 7-2
Estimated Capital Costs Required to Replace or Upgrade Onsite Systems with Nutrient Reduction OWNRS in "Cold Spot" Areas

Onsite System Type	No. of Systems	Project Capital Cost[1]
Unknown System - Requires immediate replacement or upgrading by July 12, 2003	235	$3,525,000
System with permits - must be replaced or upgraded by July 1, 2010	850	$12,750,000
Total	**1,085**	**$16,275,000**

[1]At $15,000/system.

7.2 Central/Community and Regional Wastewater Systems

As shown in Exhibit 7-1, the recommended plan includes twelve community wastewater collection and treatment systems and five regional systems. Five of the twelve community wastewater collection systems feature interim wastewater treatment plants (WWTPs) that over time will be phased into larger regional systems.

Like any major public works capital program, total funding for implementing this proposed system is a challenge, and a goal of Monroe County officials is to phase this program and seek grant monies to help offset the implementation costs. This would also keep the service rates that would be charged to residents at an affordable level. (Details on funding options are provided in Chapter 8 of this Master Plan.)

Exhibits 7-3 through 7-5 illustrate the recommended wastewater management implementation plan for the Lower, Middle, and Upper Keys, respectively, and also include "Hot Spot" areas by priority ranking. (Exhibit F-2 in Appendix F [Volume 2] presents more detailed information on the proposed wastewater management implementation plan.)

This implementation plan assumes that all existing WWTPs will remain operational until all "Hot Spot" areas are sewered, or until 2010 (when all WWTPs are required to upgrade to the Best Available Technology [BAT] or Advanced Wastewater Treatment [AWT] standard), whichever occurs first. At that time, all existing WWTPs will connect to either a community or regional system, except those existing plants that have been identified in this Master Plan to continue to serve specific areas. The following sections describe the implementation plan by region.

7.2.1 Lower Keys

In the Lower Keys, four new community wastewater systems and two new regional wastewater systems are recommended. The proposed systems are shown in Exhibit 7-3 along with estimated costs of implementation. For the Boca Chica community system and the two regional systems, Exhibits F-3, F-4, and F-5 in Appendix F provide further details on how each "Hot Spot" area is recommended to be phased into these community and regional systems over time and the costs associated with each phase.

Key West Resort Utility Community Service Area [2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Stock Island	Unsewered KW Resort Utility	$3,082,000	Extend wastewater service to unsewered areas of KW Resort Utility franchise area.

Boca Chica Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Boca Chica	Coppitt/Johnsonville/ Gulfview Porpoise Point/Gulfrest Park and adjacent area along U.S. 1	$11,600,000	Provide wastewater collection service to Hot Spot area. Construct 0.2 mgd WWTP expandable to 0.40 mgd. Other options include negotiate with NAS Key West for capacity or expansion of their WWTP, or negotiate with KW Resort Utilities for capacity or expansion of their WWTP.
14	Boca Chica	Rockland Key	$4,570,000	Provide wastewater collection service to Hot Spot area. Expand WWTP to 0.40 mgd.
16	Boca Chica	Boca Chica Ocean Shores, Tamarac Park	$4,100,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$200,000	Connect package plants to system.

Bay Point Community Service Area [1]

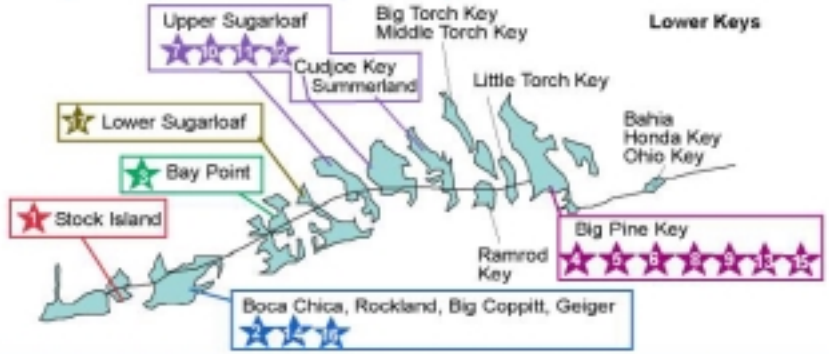
Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
3	Bay Point	Bay Point Subdivision and Saddlebunch Shores	$4,000,000	Provide wastewater collection service to Hot Spot area. Provide 0.06 mgd WWTP, capable of uprating to 0.075 mgd, for this service area.
—	—	—	—	Connect package plant to system; uprate WWTP to 0.075 mgd

Summerland/Cudjoe/Upper Sugarloaf Regional Service Area [1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Summerland	Summerland Key Cove/ Summerland Cove Isle	$12,860,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.22 mgd WWTP expandable to 0.66 mgd for this regional service area.
10	Cudjoe	Cutthroat Habor Estates, Cudjoe Ocean Shores	$10,420,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.44 mgd.
11	Upper Sugarloaf	Indian Mound Estates, Gulf Shores	$3,125,000	Provide wastewater collection service to Hot Spot area.
12	Cudjoe	Cudjoe Gardens	$3,925,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$4,000,000	Expand regional WWTP to 0.66 mgd; connect package plants to system.

Lower Sugarloaf Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
17	Lower Sugarloaf	Sugarloaf Shores, Orchid Park, adjacent area along U.S. 1	$9,349,000	Provide wastewater collection service to Hot Spot area. Provide 0.12 mgd WWTP for this service area.



Big Pine Regional Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
4	Big Pine	Whispering Pines/ Sands/Griesen/Ross Haven/Pat & Mary/Big Pine Cove, adjacent area along U.S. 1.	$11,000,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.30 mgd WWTP, expandable to 0.90 mgd for this regional service area.
5	Big Pine	Doctor's Arm/Lambert/ Tropical Bay, Palma Villa, Whispering Pines	$6,500,000	Provide wastewater collection service to Hot Spot area.
6	Little Torch	Coral Shores, Windward Beach Estates, Mate's Beach, Jolly Roger Estates, and area east of Mate's Beach south to Jolly Roger Estates.	$13,240,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.60 mgd.
8	Big Pine	Eden Pines Colony	$5,000,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.90 mgd.
9	Big Pine	Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms, and adjacent area along U.S. 1	$8,300,000	Provide wastewater collection service to Hot Spot area.
13	Ramrod	Breezeswept Beach Estates, Ramrod Shores, Ramrod Shores Marina, and area along U.S. 1	$6,690,000	Provide wastewater collection service to Hot Spot area.
15	Big Pine	Port Pines Heights	$4,750,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$400,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.

[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-6 for these existing facilities.

[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT 7-3

Recommended Wastewater Management Implementation Plan for the Lower Keys

Conch Key Community Service Area

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Marathon Secondary	Conch Key	$1,750,000	Provide wastewater collection service to Hot Spot area. Provide 0.03 mgd WWTP for this service area.

Hawk's Cay Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
6	Marathon Secondary	Duck Key	$5,500,000	Provide wastewater collection service to Duck Key. Expand Hawk's Cay WWTP to 0.30 mgd.

Long Key/Layton Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Long Key/Layton	Long Key Estates, City of Layton, area adjacent to U.S. 1.	$3,540,000	Provide wastewater collection service to Hot Spot area. Provide 0.05 mgd WWTP for this service area.

Marathon Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Marathon Primary	Little Venice (Phase I)	$6,600,000	Provide community wastewater collection system with interim 0.14 mgd WWTP.
3	Marathon Primary	Phased Regional System (Phase II)	$35,480,000	Provide wastewater collection service to Hot Spot area. Provide initial 1.0 mgd WWTP, expandable to 2.0 mgd, for this regional service area. Deactivate Little Venice WWTP and connect into regional system
4	Marathon Primary	Remainder of Regional System (Phase III)	$30,200,000	Provide wastewater collection service to Hot Spot area. Connect all package plants to regional system. Expand regional WWTP to 2.0 mgd.
5	Marathon Secondary	Grassy Key	$5,200,000	Provide wastewater collection service to Grassy Key. Treatment at Marathon Regional WWTP.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-7 for these existing facilities.
[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT 7-4
Recommended Wastewater Management Implementation Plan for the Middle Keys

The two proposed regional systems in the Lower Keys are relatively small, in terms of both volume of flow and area, thus the first phase of these WWTPs can be constructed at the actual regional WWTP site, so there is no need to build an interim WWTP that would eventually be phased out and relocated elsewhere. The plan recommends expansion of the regional plant as more "Hot Spot" areas are connected.

In addition to the new systems or extension of existing systems that were presented in Exhibit 7-3, it is recommended that seven existing facilities in the Lower Keys continue to operate and upgrade their treatment processes to meet the BAT/AWT standard by July 1, 2010. These systems include:

- KW Resort Utility
- Key Haven Utility
- Monroe County Detention Center
- Naval Air Station Key West
- Bahia Honda (three facilities)

KW Resort Utility and the Monroe County Detention Center facility are included because the 1999 Florida Legislation requires wastewater reuse facilities (KW Resort Utility effluent is applied to the Key West Golf Course and Monroe County Detention Center effluent is used for toilet flushing) to treat to AWT standards any effluent that is not applied as reuse water before it is discharged to the backup

Lower Matecumbe Community Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
9	Lower Matecumbe	Safety Harbor, Toll Gate Shore, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, Lower Matecumbe Beach	$8,900,000	Provide wastewater collection service to Hot Spot area. Provide 0.18 mgd WWTP for this service area.

Islamorada Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
6	Plantation Key	Area A - Eastern end of Plantation Key including Plantation Key Colony/Kahiki Harbor/Edemaire/ Tavernaero/Tropical Atlantic Shores	$12,280,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.75 mgd WWTP, expandable to 1.50 mgd, for this regional service area.
14	Upper Matecumbe	Entire Study Area	$16,310,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
17	Plantation Key	Venetian Shores	$5,050,000	Provide wastewater collection service to Hot Spot area.
18	Windley Key	Entire Study Area	$4,400,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
20	Plantation Key	Treasure Harbor, Plantation Ridge Coral Shores	$2,600,000	Provide wastewater collection service to Hot Spot area.
21	Plantation Key	Indian Waterways, Indian Harbor, Plantation Key, Lysiloma, Key Heights, Vacation Village, Aergood Heights, Pearl City	$9,340,000	Provide wastewater collection service to Hot Spot area.
23	Plantation Key	Remainder of Planation Key	$16,030,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$760,000	Connect package plants on Plantation Key to system.

EXHIBIT 7-5
Recommended Wastewater Management Implementation Plan for the Upper Keys

Tavernier/Key Largo Regional Service Area[1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	PAED 19/20	Lake Surprise/Sexton Cove, Ocean Isle Estates, and adjacent area on U.S. 1	$11,000,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
2	PAED 18	Key Largo Trailer Village, Largo Gardens, Hibiscus Park and area adjacent to U.S. 1	$10,270,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
3	PAED 18	Cross Key Waterway Estates & Largo Sound Park/Anglers Park Shores/South Creek Village and area along U.S. 1	$9,700,000	Provide community wastewater collection system with interim 0.140 mgd WWTP.
4	PAED 16	Area A, Wynken, Blyken & Nod	$1,670,000	Provide wastewater collection service to Hot Spot area. Connect to one of two adjacent existing WWTPs, each of which appears to have adequate excess capacity to serve this Hot Spot.
5	PAED 15	Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park, and along U.S. 1	$8,600,000	Provide community wastewater collection system with interim 0.12 mgd WWTP.
7	PAED 19/20	Remainder of PAED 19/20-Stillwright Point/Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City	$26,640,000	Provide wastewater collection service to Hot Spot area. Initiate regional AWT WWTP. Construct 1.50 mgd facility expandable to 2.25 mgd. Deactivate Hot Spot Priority Areas 1, 2, and 3 WWTPs and connect to regional WWTP.
8	PAED 17	Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cove, Lazy Lagoon, Point Pleasant Sunset Cove	$11,100,000	Provide wastewater collection service to Hot Spot area.
10	PAED 18	Bahia Mar Estates/Pamela Villa/Winston Waterways	$3,500,000	Provide wastewater collection service to Hot Spot area.
11	PAED 17	Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor, Harbor Shores, El Dorado	$6,440,000	Provide wastewater collection service to Hot Spot area.
12	PAED 16	Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	$7,290,000	Provide wastewater collection service to Hot Spot area.
13	PAED 15	Old Tavernier	$11,950,000	Provide wastewater collection service to Hot Spot area. Deactivate Hot Spot Priority Area 5 WWTP and connect to regional WWTP. Expand regional WWTP to 2.25 mgd.
15	PAED 17	Sunset Waterways, Key Largo Park	$6,400,000	Provide wastewater collection service to Hot Spot area.
16	PAED 18	Bermuda Shores, Twin Lakes	$2,500,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$2,300,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-8 for these existing facilities.
[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

shallow injection wells. As all the effluent cannot be applied to the golf course during periods of extended rain or used for toilet flushing, these facilities must be upgraded to meet the AWT effluent standard for the wastewater that is disposed to the shallow injection well systems.

Although the Monroe County Detention Center facility is within the City of Key West, it has been included in this Master Plan because it is owned and maintained by Monroe County. These existing systems and the estimated costs of the upgrades are summarized in Exhibit 7-6.

7.2.2 Middle Keys

In the Middle Keys, two new community wastewater systems and one new regional system are recommended. The proposed Middle Keys service areas are shown in Exhibit 7-4. Other than Duck Key, Conch Key, and Long Key/Layton, all study areas of the Middle Keys are within the City of Marathon.

In addition to the new systems described above, it is recommended that six existing facilities in the Middle Keys continue to operate and upgrade their treatment process to meet the BAT/AWT standard by July 1, 2010. These systems include:

- Hawk's Cay (Hawk's Cay portion of AWT upgrade)
- West End Long Key (three facilities)
- East End Long Key (two facilities)

These existing systems and the estimated costs of the upgrades are summarized in Exhibit 7-7.

7.2.3 Upper Keys

In the Upper Keys, one new community wastewater system is recommended in Lower Matecumbe, and two new regional systems are recommended: the 1.5-million gallon per day (mgd) system to serve Islamorada Regional Wastewater Management District; and a 2.25-mgd system to serve the Tavernier/Key Largo Regional Wastewater Management District.

7.2.3.1 Islamorada, Village of Islands

The Village of Islamorada must decide whether it ultimately will participate with Monroe County in creating a regional wastewater system for the entire Upper Keys, or whether it will develop its own wastewater service areas. In the service area analyses (see Chapter 5 and Technical Memorandum No. 12 in Volume 5, *Supporting Documents*), costs developed for these different alternatives indicate that costs to the Village are only slightly more (7 percent) if the Village develops its own wastewater service areas rather than joins with Monroe County. Therefore, it is assumed that the Village will develop its own wastewater service areas. The

EXHIBIT 7-6
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Lower Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/ AWT Standard	Capital Cost	Increased Annual O&M Cost
Stock Island	KW Resort Utility	0.50	AWT	**$760,000**	**$3,000**
Stock Island	Key Haven Utility	0.20	AWT	**$500,000**	**$40,000**
Stock Island	Monroe County[1] Detention Center	0.105	AWT	**$250,000**	**$2,000**
Boca Chica	NAS Key West	0.40	AWT	**$670,000**	**$80,000**
Bahia Honda	Bahia Honda State Park	0.0083	BAT	$98,000	$16,000
	Bahia Honda State Park	0.010	BAT	$102,000	$16,000
	Sunshine Key Campground	0.060	BAT	$187,000	$23,000
	Total For Bahia Honda Service Area			**$387,000**	**$55,000**

[1]Though located in the City of Key West, and beyond the boundaries of this master plan, the detention center is owned and operated by Monroe County, and therefore has been included in the master plan study.

EXHIBIT 7-7
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Middle Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/AWT Standard	Capital Cost	Increased Annual O&M Cost
Marathon Secondary[1]	Hawk's Cay[1]	0.196	AWT	**$1,600,000**	**$40,000**
West End Long Key	Ocean Bay Condominium	0.006	BAT	$93,000	$15,000
	Long Key State Park	0.010	BAT	$99,000	$16,000
	Outdoor Resorts	0.060	BAT	$192,000	$23,000
	Total for West End Long Key			**$384,000**	**$54,000**
East End Long Key	Oceanside Isle Apartments	0.0070	BAT	$94,000	$15,000
	Fiesta Key Campground	0.060	BAT	$192,000	$23,000
	Total for East End Long Key			**$286,000**	**$38,000**

[1]Upgrade of Hawk's Cay portion of treatment capacity only.

likely Islamorada wastewater service areas would include:

- A community system serving the "Hot Spot" area that includes Safety Harbor, Toll Gate Shores, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, and Lower Matecumbe Beach.
- The remaining eastern portion of Lower Matecumbe Key would continue with onsite systems.
- Ultimately, a regional system serving Upper Matecumbe, Windley, and Plantation Keys is recommended. Initially, however, community systems to serve the highest ranked "Hot Spot" areas are recommended. Likely service areas and the order of implementation of "Hot Spot" community systems are shown in Exhibit 7-5 and Appendix F-2, in Volume 2.

7.2.3.2 Remainder of Upper Keys

In the Upper Keys from Tavernier (Tavernier Creek at Mile Marker 91) to Key Largo (at Mile Marker 106), interim community systems for "Hot Spot" areas serving approximately 700 to 900 equivalent dwelling units (EDUs) are recommended initially, until the number of community systems increases to the point where a regional system is more affordable. This system size takes advantage of economies of scale to the greatest extent possible, while keeping project costs to implement these systems in the $10,000,000 to $12,000,000 range. At this cost range, it is more likely that grants will be received, thus making wastewater rates affordable, as opposed to a larger project where much larger grant amounts would be required to make wastewater rates affordable, but are less likely to be awarded.

In the future, when the number of small community systems and the number of customers increase, it will become more economical to consolidate the smaller community treatment systems into a larger regional treatment facility. Exhibit 7-5 presents the community wastewater collection and treatment systems, and the corresponding "Hot Spot" areas they will serve. This exhibit also defines the point where the regional system would be implemented. Details of the phasing for the Tavernier/Key Largo regional wastewater system are presented in Appendix F, in Exhibit F-6 (Volume 2), which

presents the interim central community wastewater systems and the subsequent regional system.

In addition to the new systems summarized in Exhibit 7-5, four other treatment facilities in the Upper Keys are recommended to continue to operate and upgrade their treatment processes to meet the BAT/AWT standard by July 1, 2010. These systems include:

- Ocean Reef Club (North Key Largo Utility Company)
- Area at Jewfish Creek (in PAED 22, Study Area 25-2, two facilities)
- Area at County Line (in PAED 22, Study Area 25-1)

These existing facilities and the estimated costs of the recommended upgrades are summarized in Exhibit 7-8.

EXHIBIT 7-8
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Upper Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/AWT Standard	Capital Cost	Increased Annual O&M Cost
Ocean Reef Club (Study Area 27)	No. Key Largo Utility Company	0.55	AWT	$1,500,000	$143,000
	Extend sewer service to unsewered area.			$4,160,000	$36,000
	Total for Ocean Reef Club			**$5,660,000**	**$179,000**
PAED 22 at Jewfish Creek (Study Area 25-2)	Gilbert's	0.010	BAT	$100,000	$16,000
	Anchorage	0.010	BAT	$100,000	$16,000
	Total for Gilbert/Anchorage			**$200,000**	**$32,000**
PAED 22 at County Line (Study Area 25-1)	Barefoot Cay Treatment Plant	0.045	BAT	$164,000	$22,000
	Barefoot Cay Sewer Extension[1]			$300,000[1]	$3,000
	Total for Barefoot Cay			**$464,000**	**$25,000**

[1]Low pressure sewer grinder pump system to serve unsewered adjacent area.

7.2.4 Interim Treatment Plants

Because the Tavernier/Key Largo regional system, as well as the Islamorada and Marathon regional systems, are larger than the regional systems proposed in the Lower Keys, both in terms of flow and area, it is not cost effective to locate the initial WWTP at the proposed regional facility site. Instead, central community wastewater collection systems with interim WWTPs to serve the "Hot Spot" areas are a more cost-effective solution. When the regional WWTPs become operational, the interim WWTPs would be decommissioned and relocated elsewhere, and the wastewater would be transmitted to the regional facilities.

7.3 Wastewater Solids Management

7.3.1 Regionalization Options

Given the recommended wastewater management facilities, an evaluation to determine the best solids management plan for all 28 existing and proposed wastewater facilities was performed. Three options were evaluated:

- **Option 1 – Minimum Regionalization**: Operate solids handling facilities at all 14 WWTPs of 100,000 gallons per day (gpd) capacity or greater.
- **Option 2 – Maximum Regionalization:** Operate solids handling facilities only at the largest WWTP in the Lower,

EXHIBIT 7-9
Cost Comparison of Solids Handling Location Options

Location Option	Estimated Total Annual Cost[1]
1. Minimum Regionalization	$2,700,000/year
2. Maximum regionalization	$3,100,000/year
3. Intermediate Regionalization	$2,600,000/year

[1]Includes capital and O&M costs, with aerobic digestion, dewatering, and agricultural land application assumed for regional facilities. Capital costs amortized over 20 years at 6 percent interest; O&M costs based on operation of facility at 80 percent of design ADF.

Middle, and Upper Keys, with solids from all other WWTPs trucked to the nearest of these facilities. The Big Pine, Marathon, and Tavernier/Key Largo WWTPs were assumed to serve as the three regional facilities.

- **Option 3 – Intermediate Regionalization:** Operate solids handling facilities at the nine WWTPs of 400,000 gpd capacity or more, with solids from the remaining plants trucked to the nearest of these facilities. These nine plants would include three existing plants (KW Resort, U.S. Naval Air Station, and Ocean Reef Club) and six of the new plants.

Cost comparisons for the three options, which are summarized in Exhibit 7-9, suggest that a high degree of regionalization of solids management facilities will not be cost effective. Instead, except for WWTPs with capacities less than 100,000 gpd, the evaluation indicates that WWTPs should treat and dewater their own solids and transport the dewatered solids to mainland Florida.

Solids handling at each treatment facility was included when developing cost estimates for the wastewater facilities recommended in this Master Plan. Hence, the cost estimates for wastewater treatment facilities reflect accurately the solids management plan recommended, and do not need to be adjusted for a different solids management scheme.

7.3.2 Recommended Solids Management Plan

The following summarizes the recommended solids management plan. A detailed discussion of the solids management plan evaluation process is provided in Technical Memorandum, *Wastewater Solids Management Plan for Monroe County*, Volume 4, *Supporting Documents*.

7.3.2.1 WWTPs with Less than 100,000 gpd Capacity

Of the 28 WWTPs proposed to serve the planning area, eleven existing plants and three proposed new plants will have ultimate capacities of less than 100,000 gpd. These small plants cannot cost-effectively treat solids onsite and are recommended to provide temporary aerated storage only. Unstabilized or partially stabilized solids should be periodically transported to one of the existing or proposed regional or larger community WWTPs in the Lower, Middle, and Upper Keys. In the interim period before a regional solids handling facility is available, the solids from these smaller WWTPs should continue to be transported to one of the three Monroe County Solid Waste Transfer Stations.

7.3.2.2 WWTPs with Capacity of 100,000 gpd or Greater

The Master Plan recommends that 14 WWTPs with a capacity of 100,000 gpd or greater ultimately serve the planning area. These include five new regional WWTPs, three new community WWTPs, and six existing WWTPs. The five new regional and three new community WWTPs will generally be the largest plants in operation in the planning area. Generally, these WWTPs are recommended to treat and dewater their own solids. However, depending on the timing of construction of the new community plants and the different phases of the regional plants, hauling of unstabilized solids for treatment and dewatering, or hauling of stabilized solids for just dewatering to already operating facilities should also be evaluated as an interim or preferred alternative.

The six existing community WWTPs that will continue to operate each have independent solids handling facilities centered around the aerobic digestion process. Most likely, it will be cost effective to maintain these existing solids handling facilities currently in operation. However, a detailed evaluation of each facility will be necessary to determine if the existing facilities are adequate. If expansion or major improvements are necessary, particularly at the four smallest facilities having capacities of 0.2 mgd or less, then transporting solids to a nearby regional facility for stabilization and/or dewatering may be a more cost-effective option.

7.3.2.3 Interim WWTPs

Solids management facilities should not be constructed at interim WWTPs because of their limited lifespan. Solids from these facilities should be transported to one of the Monroe County Solid Waste Transfer Stations for ultimate disposal at Miami-Dade.

7.3.2.4 Solids Treatment and Disposal

Class B aerobic digestion followed by dewatering and truck transport of cake to a remote land application site in mainland Florida is the recommended solids management system for all residual solids from the wastewater treatment facilities.

7.3.2.5 OWNRS

Waste sludge from the 1,085 OWNRS is recommended to be contract-hauled to the existing Monroe County Solid Waste Transfer Stations and then to Miami-Dade, as is the current practice for septage. If issues arise with this method, a sludge receiving facility and expanded solids treatment capacity could be installed at one or several of the regional WWTPs, most likely the Big Pine, Marathon, or Tavernier/Key Largo Regional WWTPs.

7.3.2.6 Grease Management

Continuation of the current practice of transporting waste grease to the Monroe County Solid Waste Transfer Stations for ultimate disposal at Miami-Dade is recommended. Disposal of waste grease at the community or regional WWTPs should be avoided because of the potential for odors.

7.4 Capital Costs Required to Implement the Master Plan

As shown in Exhibit 7-10, the capital costs required to improve wastewater management practices, as recommended by this Master Plan, are approximately $438,000,000. These costs assume that, other than those existing WWTPs that will continue to serve given isolated areas or existing functioning private wastewater utilities, all existing WWTPs will connect into the central community wastewater systems or regional systems once all the "Hot Spot" areas are served, or by 2010, whichever occurs first.

The seven largest systems, in terms of capital cost, (one of which is all the "Cold Spot" areas that will have to upgrade onsite systems to nutrient reduction OWNRS) represent 89 percent of the $438,000,000 total cost. (See Exhibit 7-11.)

7.5 Wastewater Reuse

Although there are advantages associated with wastewater reuse, the high cost associated with additional facilities and the limited availability of suitable areas to irrigate make this option more difficult to implement in the Florida Keys than in other areas. As noted in Section 3.7.3, the cost required to provide reuse water for irrigation is expected to be considerably higher than the current cost to provide potable water (an estimated $12.52/1,000 gallons for reuse water vs. $4.93/1,000 gallons for potable water). Consequently, initiating wastewater reuse does not provide a cost-savings incentive to wastewater customers in the Keys. Therefore, a policy mandating wastewater reuse would have to be initiated by local, state, or federal regulatory agencies before full-scale wastewater reuse could be implemented in the Keys. However, mandating a reuse policy should be carefully considered because it may be more economically sound to produce more potable water from seawater and distribute it to the existing potable water distribution system than to produce and distribute reclaimed water through a separate reuse distribution system.

An immediate initial step in determining the practicality and economics of wastewater reuse in the Keys should be to conduct reuse feasibility studies

EXHIBIT 7-10
Estimated Capital Cost Required to Implement the Master Plan

Wastewater System Service Areas	Estimated Capital Cost[1]
KW Resort Utility	$3,080,000
Big Coppitt Service Area	$20,500,000
Bay Point Service Area	$4,000,000
Lower Sugarloaf Service Area	$9,350,000
Summerland/Cudjoe/Upper Sugarloaf Regional	$34,300,000
Big Pine Regional	$55,900,000
KW Resort Utility (AWT for non reuse)	$760,000
Key Haven Utility	$500,000
Monroe County Detention Center (AWT for non reuse)	$250,000
NAS Key West (Boca Chica)	$670,000
Bahia Honda	$390,000
Marathon Regional	$72,300,000
Conch Key Service Area	$1,750,000
Long Key/Layton Service Area	$3,540,000
Hawk's Cay (Hawk's Cay portion of AWT upgrade)	$1,600,000
West End Long Key	$380,000
East End Long Key	$290,000
Lower Matecumbe Service Area	$8,900,000
Islamorada Regional	$66,800,000
Tavernier/Key Largo Regional	$119,400,000
Ocean Reef Club	$5,660,000
PAED 22 at Snake Creek	$200,000
PAED 22 at County Line	$460,000
Onsite Unpgade of Unknown Systems	$3,525,000
Onsite Upgrade in 2010	$12,750,000
Total	**$437,950,000**

[1]Capital costs include a 20% contingency and include all construction costs, including the costs to decommission existing onsite systems and the costs of new building sewers on private property from the house or building to the street. Capital costs also include all engineering, construction administration and inspection, land acquisition, legal fees, and financing charges.

throughout the different service areas. These studies should establish firm amounts of reclaimed water to which reuse customers are willing to commit and pay for.

7.6 Alternatives for Implementing Wastewater Infrastructure Systems

In implementing the recommended capital improvements in this Master Plan, a variety of project delivery methods could be used, from the traditional design-bid-build approach to many different project delivery alternatives that are being employed throughout the United States. The delivery alternatives are presented in Exhibit 7-12. The following sections describe these alternatives and the pros and cons of each.

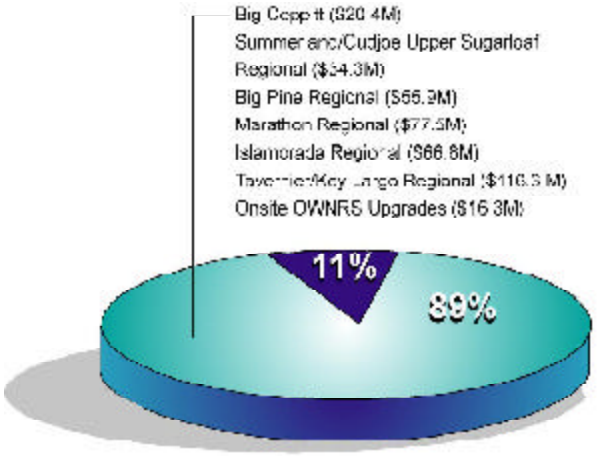


EXHIBIT 7-11
The seven largest systems represent 89% of the total $438,000,000 capital cost of the Monroe County program.

7.6.1 Traditional Project Delivery

In the traditional design-bid-build method of project delivery, the owner contracts with an engineer to design the project, develop complete contract documents, and assist the owner in bidding the project. The owner contracts separately with a general contractor, generally the low bidder in public works projects, to build the facility. Generally, the engineer assists the owner during the construction of the project. No contractual relationship exists between the engineer and contractor. In this traditional project delivery method, the owner assumes all cost and project delivery risks, but has a good degree of control of the project in terms of quality and owner preferences.

This traditional method of project delivery has been used widely throughout the United States for the last 100 years. As a result, owners, engineers, suppliers, contractors, and regulators understand how this method works, and owners and political governing bodies accept the results. From a timing perspective, the traditional method of project delivery generally is the most time-consuming alternative.

7.6.2 Construction Management

Construction management is similar to the traditional method of project delivery in that all the design documents are prepared first. However, the construction manager replaces the general contractor as the overall coordinator of construction. The construction manager receives bids from the various trade subcontractors and suppliers.

With this alternative, however, the construction manager does not assume cost or project delivery risks normally assumed by a general contractor. These project risks are retained by the owner, although the expectation of most owners is that the project will be constructed on-budget and within the time constraints associated with the project delivery. This usually results in cost savings to the owner over the fee that would have been charged by the general contractor performing a similar function.

Normally, the design engineer is either contracted directly by the owner or serves as a team member under a direct subcontract to the construction management firm.

7.6.3 Construction Management-at-Risk

The construction management-at-risk alternative is similar to the construction management alternative in terms of function, except the construction manager offers guarantees to the owner related to project price, delivery time, and/or overall process performance. In exchange for any or all of these guarantees, the construction manager normally seeks an additional fee to take on the risk, and the owner benefits knowing that the project has a construction cost upper limit, that it will be delivered on time, and that the performance requirements of the project will be met and guaranteed.

Further, in a traditionally delivered project, minimum standards for the level of quality are established by the contract documents; however, the quality of the finished project may also be influenced by cost in a low-bid environment. With either of the construction management alternatives, the owner has more control over the quality of the finished project because the owner is involved in more of the cost decisions affecting the construction process.

As with construction management, although the individual packages are bid, usually to prequalified firms, the owner is exposed to the bid results of the individual trade subcontractors and equipment suppliers and vendors. The owner, not the general contractor, in conjunction with

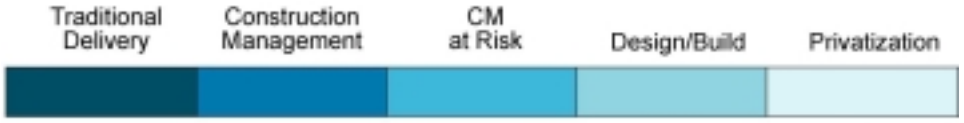


EXHIBIT 7-12
The Public-to-Private Spectrum of Project Delivery Alternatives

the construction manager, then has the flexibility to decide what equipment and material are to be furnished on the project, based on the prices received and the detailed project cost estimate prepared by the construction manager. This delivery method allows the owner to control the quality of the equipment and materials used on the project.

As a general guideline, construction management projects can usually be delivered in a somewhat shorter time period than those delivered under traditional methods.

7.6.4 Design/Build

The design/build alternative offers the owner the ability to deliver a project rapidly and cost effectively. In this case, the owner prepares a bid package. This bid package can vary in the amount of detail provided, depending on what the owner wants, the schedule desired, and the risks willing to be assumed. The ideal design/build procurement occurs when the owner retains a program management firm that prepares design criteria and a design development document for the project that is approximately 15 to 20 percent complete. At this point, the designer/builder still has an opportunity to be creative, while the owner maintains some control by developing, or participating in, the design up to the 15- to 20-percent stage.

Proposals, which include project approach, project team qualifications, and price, are solicited from qualified designer/builders, with the award usually based on the lowest project cost, although there are many other qualitative selection criteria that could be used. Once selected, the designer/builder is charged with implementing the conceptual design over the specified project delivery period.

For some owners, this concept of project delivery best meets their expectations for the following reasons:

Sole Source Responsibility. Because the contractor and engineer are operating as a team, one entity is responsible for the delivery, acceptability, and performance of the finished project.

Cost. Often, these projects are the most cost-effective for the owner for several reasons:

1. The delivery time is much shorter and administrative and construction costs, therefore, tend to be lower.
2. The design and its related costs should be completed only to the extent required by the designer/builder and permitting agencies.
3. Because 80 to 85 percent of the design details are left up to the designer/builder, the marketplace will provide the owner with the most cost-effective solution that fulfills the obligations contained in the request for proposal (RFP).

Time. The overall project implementation period is normally shortened. On most projects, this can shorten the schedule by at least 3 to 6 months.

In using this method of delivery, however, owners must recognize that they will have less control over the outcome of the project than with other methods.

7.6.5 Privatization

Privatization concepts are gaining more appeal as communities and wastewater utilities across the United States address stringent fiscal issues. Privatization includes a variety of options, ranging from outsourcing specific functions (e.g., sludge hauling, lawn maintenance), to contract operations of the facility, to full ownership and operation of facilities. At the present time, more than 500 large municipal treatment plants are operated by private contract operations firms throughout the United States and abroad. In the Keys, almost all the treatment plants are operated by private contract operations firms. Privatization options include:

Contract Operations: Where the owner contracts with a private operations firm to operate existing or newly constructed facilities.

Design/Build/Operate: Where the owner contracts with a private firm to design, build, and operate the facility for a fixed fee. Generally, the number of years of operation is defined by contract, and there

is a cost index escalation factor allowed for annual operations.

Design/Build/Finance/Operate: Where the owner contracts with a private firm not only to design, build, and operate the facility, but also to finance the facility for a fixed fee.

7.7 Recommended BOCC Implementation Actions

To accomplish the water quality objectives of the *Year 2010 Comprehensive Plan*, and to move the implementation of this Master Plan forward, the Monroe County Board of County Commissioners (BOCC) should take the following actions:

1. Continue to pursue state and federal grant money in association with the Florida Keys Aqueduct Authority (FKAA).
2. Request the FKAA to adopt service areas as recommended in the Master Plan.
3. Take legal action to establish municipal sewer service districts for the respective service areas.
4. Initiate land purchases of wastewater facility sties, as outlined in the Master Plan. This should also include the smaller vacuum station sites and the interim WWTP sites, if additional facilities are required.
5. Develop and adopt interim onsite wastewater system standards and policies for "Hot Spot" areas; this will have to be coordinated with the Florida Department of Health (FDOH).
6. Adopt a policy to address the "double charge" issue. (Paying to upgrade an onsite system to a nutrient reduction OWNRS, and then paying again to connect to the sewer system when central sewers are provided.)

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